REMARKS

This response is intended as a complete response to the Office Action dated February 7, 2007. In view of the following discussion, the Applicants believe that all claims are in allowable form.

The Applicants thank Examiners Umez-Eronini and Norton for their time and input with respect to the present application as a result of the teleconference between the Examiners and Alan Taboada on May 7, 2007. The Applicants have nothing further to add to the Interview Summary dated May 10, 2007.

CLAIM AMENDMENTS

Although presently withdrawn, independent claim 32 has been amended to correspond with the present amendment to independent claims 1 and 11.

SPECIFICATION REJECTIONS

A. 35 USC §132(a)

The specification is rejected under 35 USC §132(a) for allegedly having new matter introduced due to prior claim amendments to claims 1 and 11. The Applicants respectfully disagree as the specification, at least at paragraph [0028], clearly provides support for the claims. However, to expedite prosecution, the Applicants have amended independent claims 1 and 11 to strike the previous amendment. Moreover, the limitations added to the claims supported by the specification at least at paragraph [0028], as discussed more fully below.

Thus, the Applicants submit that the present rejection is moot and that the specification satisfies 35 USC §132(a). Accordingly, the Applicants respectfully request that the rejection be withdrawn.

CLAIM REJECTIONS

A. 35 USC §112, First Paragraph Claims 1-21, 42 and 43

The Examiner maintains a rejection of Claims 1-21, 42 and 43 under 35 USC §112, 1st Paragraph as failing to comply with the written description requirement. The Applicants respectfully disagree as the specification, at least at paragraph [0028] clearly

provides support for the claims. However, to expedite prosecution, the Applicants have amended independent claims 1 and 11 to more clearly recite aspects of the invention.

Specifically, claims 1 and 11 have been amended to strike the objected to phrase in limitation (d) and to recite, "directing radiation onto the substrate as the material layer is etched, wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms," in limitation (c). The amended limitation appears practically verbatim in the specification at least in paragraph [0028].

Thus, the Applicants submit that claims 1-21, 42 and 43 satisfy the requirements of 35 USC §112 and are patentable thereunder. Accordingly, the Applicants respectfully request that the present rejection be withdrawn, and the claims allowed.

B. 35 USC §102 Claims 1-2, 4-5, 7-10 and 42; 11-12, 15-16, 18-21 and 43

Claims 1-2, 4-5, 7-10 and 42; 11-12, 15-16, 18-21 and 43 stand rejected as being anticipated by United States Patent No. 5,835,221 issued November 10, 1998, to *Lee, et al.* (hereinafter *Lee*). Applicants respectfully disagree. However, the Applicants have amended claims 1 and 11 to more clearly recite aspects of the invention.

Independent claims 1 and 11 recite limitations not taught or suggested by *Lee*. With respect to 35 USC §102, or "anticipation," the Federal Circuit has repeatedly stated that "there is no anticipation unless all of the same elements are found in exactly the same situation and united in the same way . . . in a single prior art reference." Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 894 (Fed. Cir., 1984); Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 U.S.P.Q. (BNA) 781, 789 (Fed. Cir. 1983).

Lee discloses providing a substrate comprising a material layer having an initial thickness on the order of 1000's of Angstroms, etching the material layer on the substrate, directing radiation having wavelengths on the order of hundreds of nanometers onto the substrate as the material layer is etched, measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength, and terminating the etch step upon measuring a predetermined metric for the change in intensity radiation reflected from the substrate at the pre-selected wavelength. (*Lee*, Figures 2-3 and corresponding text.)

However, *Lee* fails to teach or suggest a process including directing radiation onto the substrate as the material layer is etched, wherein the material layer is a high-k dielectric material layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms, as recited in claim 1, or directing radiation onto the substrate as the gate dielectric layer is etched, wherein the gate dielectric layer is a high-k gate dielectric layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the gate dielectric layer in Angstroms, as recited in claim 11.

The Examiner asserts that the silicon oxide layer of Lee is the same as a high k dielectric layer. However, the Applicants respectfully disagree. Silicon oxide has been a standard dielectric material for use in semiconductor fabrication. The shrinking of feature size and thus, material layers in devices has required the use of materials having higher dielectric constants, such as, for example, hafnium dioxide (HfO_2) or hafnium silicate ($HfSiO_2$), as utilized in the present application. The Examiner has not cited any references nor provided any line of reasoning as to why the silicon oxide of Lee is equivalent to a high k dielectric material as recited in the present claims.

In addition, the Examiner cites *Lee*, in reference to Figure 2, listing the material layers as a 1500 Å oxide mask, a 1125 Å TiN film, and a 1625 Å polysilicon film. Similarly, with reference to Figure 3, the Examiner cites the material layers as a 1000 to 2000 Å oxide mask, a 1000 Å titanium nitride film, and a 2000 Å polysilicon film. Every one of these material layers cited by the Examiner, as well as every material layer disclosed in the reference, is on the order of <u>thousands</u> of Angstroms.

The Examiner also cites the pre-selected wavelengths used to etch the material layers disclosed by *Lee* as being 2.0 eV (~620 nm), 2.8 eV (~443 nm), 3.3 eV (~376) and 4.0 ev (~310 nm). Every one of these wavelengths cited by the Examiner, as well as every wavelength disclosed in the reference, is on the order of <u>hundreds</u> of nanometers. Accordingly, *Lee* fails to teach or suggest a process wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer (or gate dielectric layer) in Angstroms because every disclosed wavelength in nanometers (i.e., hundreds) is less than the order of the thickness of the disclosed material layers in Angstroms (i.e., thousands). Therefore, a *prima facie* case

of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 1 and 11.

In the Advisory Action dated October 4, 2006, the Examiner presented a table (Table A) entitled, "Comparison of Preselected Wavelengths in nm to Intensity of High-k Dielectric Material to be Etched in Angstroms." The Examiner asserts that the table shows that the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material layer in Angstroms. (Advisory Action, p. 2, ll. 17-18.) The Applicants respectfully disagree.

Table A is substantially reproduced, below:

Preselected Wavelength, eV	2	2.8	3.3	4.0
nm	620	443	376	310
Thickness of silicon oxide dielectric, Å	1000-2000	1000-2000	1000-2000	1000-2000

As is clearly shown by the table, in each example, the wavelength is hundreds of nm (310 – 620), while the thickness of the silicon oxide dielectric is thousands of Å (1000 – 2000). Hence, *Lee* clearly fails to fails to teach or suggest a process including directing radiation onto the substrate as the material layer is etched, wherein the material layer is a high-k dielectric material layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms, as recited in claim 1, or directing radiation onto the substrate as the gate dielectric layer is etched, wherein the gate dielectric layer is a high-k gate dielectric layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the gate dielectric layer in Angstroms, as recited in claim 11. Therefore, a *prima facie* case of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 1 and 11.

In the Office Action dated February 7, 2007, the Examiner cites Wikipedia to assert that the 620 nm wavelength disclosed in *Lee* is on the same order as the thickness of the oxide mask (1000 Angstroms). The Applicants respectfully disagree. To begin with, Wikipedia is a dynamic, ever-changing website that may be freely changed by anyone and is policed only by its' users. Moreover, the Examiner has

selectively cited Wikepedia to provide one example of the term. The Wikepedia entry also states that the order of magnitude of a number is "the number of powers of 10 contained in a number." This definition is consistent with the usage that the Applicants have provided examples of in the specification and in arguments presented to the Examiner.

Specifically, *Lee* teaches a wavelength in hundreds of nm (310 – 620), and a thickness of a silicon oxide dielectric in thousands of Å (1000 – 2000). These examples clearly have different orders of magnitude (hundreds versus thousands) Thus, *Lee* clearly fails to fails to teach or suggest a process including directing radiation onto the substrate as the material layer is etched, wherein the material layer is a high-k dielectric material layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms, as recited in claim 1, or directing radiation onto the substrate as the gate dielectric layer is etched, wherein the gate dielectric layer is a high-k gate dielectric layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the gate dielectric layer in Angstroms, as recited in claim 11. Therefore, a *prima facie* case of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 1 and 11.

Thus, independent claims 1 and 11, and claims 2, 4, 5, 7-10 and 42; 12, 15-16, 18-21 and 43 depending therefrom, are patentable over *Lee*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

C. 35 USC §103 Claims 6 and 17

Claims 6 and 17 stand rejected under 35 USC §103 in view of *Lee* and and in view of U.S. Patent No. 5,348,614 issued September 20, 1994, to Jerbic (hereinafter *Jerbic)*. The Applicants respectfully disagree.

Independent claims 1 and 11, as amended and from which claims 6 and 17 respectively depend, recite limitations not taught or suggested by any combination of *Jerbic* and *Lee*. The patentability of amended claims 1 and 11 over *Lee* has been discussed above. *Jerbic* is cited to show that optical filters may be used to filter out certain wavelengths emitted by a particular species. However, *Jerbic* fails to teach or

suggest the limitations missing from *Lee* as discussed above with respect to independent claims 1 and 11.

Accordingly, the teachings of *Jerbic* cannot be used to modify *Lee* in a manner that yields an etch endpoint detection process that includes directing radiation onto the substrate as the material layer is etched, wherein the material layer is a high-k dielectric material layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms, as recited in claim 1, or directing radiation onto the substrate as the gate dielectric layer is etched, wherein the gate dielectric layer is a high-k gate dielectric layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the gate dielectric layer in Angstroms, as recited in claim 11. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Lee* and *Jerbic* fails to yield each of the claimed elements of independent claims 1 and 11, and all claims depending therefrom.

Thus, claims 6 and 17 are patentable over *Lee* in view of *Jerbic*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

D. 35 USC §103 Claims 3 and 42; and 13-14 and 43

Claims 3 and 42, and13-14 and 43 stand rejected as being unpatentable over *Lee* in view of United States Patent No. 6,518,106 B2 issued February 11, 2003 to Ngai et al. (hereinafter *Ngai*). The Applicants respectfully disagree.

The Examiner cites *Ngai* to show that the dielectric may be hafnium dioxide. However, *Ngai* fails to teach or suggest a modification of the teachings of *Lee* that would result in an etch endpoint detection process that includes directing radiation onto the substrate as the material layer is etched, wherein the material layer is a high-k dielectric material layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the material layer in Angstroms, as recited in claim 1, or directing radiation onto the substrate as the gate dielectric layer is etched, wherein the gate dielectric layer is a high-k gate dielectric layer, or wherein the radiation has a wavelength in nanometers that is on the order of the initial thickness of the gate dielectric layer in Angstroms, as recited in claim 11. Therefore, a *prima facie* case of

obviousness has not been established because the combination of *Lee* and *Ngai* fails to yield each of the claimed elements of independent claims 1 and 11, and all claims depending therefrom.

NEW CLAIMS

New claims 44-51 have been added to the application. New independent claim 44 recites limitations similar to claims 1-3 as a single independent claim. The Applicants submit that such limitations are not taught or suggested by the prior art for reasons similar to that discussed above. Claims 45-51 depend from new claim 44 and are patentable at least for that reason. Accordingly, the Applicants request entry and allowance of these claims.

CONCLUSION

The Applicants submit that all claims now pending are in condition for allowance. Accordingly, both consideration of this application and swift passage to issue are earnestly solicited. If the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone Alan Taboada at (732) 935-7100 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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